U.S. DIVERS®
AQUA-LUNG®

monitor3 air

HOSELESS DIVE COMPUTER

Owner's Manual

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Monitor 3 Air Owner's Manual, Part Number 7454-95

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Warranty

U.S. Divers Co., Inc. guarantees the Monitor 3 Air under the U.S. Divers 30-Day Satisifaction Guarantee and makes available the Two year Warranty
30-Day Satisfaction Guarantee.

If you are not completely satisfied with the performance of this product for the first 30 days after purchase, return it to your U.S. Divers Pro-Line Dealer for an exchange of equal U.S. Divers Co., computer products. It does require a proof of purchase receipt to be returned with the product.

Two-Year Limited Warranty

After receipt of a completed warranty card, U.S. Divers will extend a two year limited warranty. U.S. Divers Co., Inc. warrants this product to be free of material defects and/or craftsmanship under normal, recreational SCUBA use (non-commercial or non-military use) and with annual maintenance described within this manual. Should the Monitor 3 Air prove to be defective, it will be repaired or replaced, at U.S. Divers' discretion, free of charge, excluding shipping and handling charges.

Limitations

This warranty specifically does not extend to the plastic computer face, battery, accidental damage, abuse, modification or tampering. The original warranty card must be on file at U.S. Divers to be eligible for the two-year coverage and any warranty service. This card is supplied in this manual and must be mailed within 15 days of purchase. Warranty is non-transferable and applies to the original owner only. Warranty service does not include the price of labor. It covers replacement or repair of parts only.

Warranty Conditions

Product must have been purchased from an Authorized U.S. Divers Pro-Line Dealer. If this product is obtained from any other source, you are considered the second owner, in which case the warranty is void. This warranty only applies to non-commercial use. Warranty does not apply to commercial, military, or rental use. The manufacturer will replace or repair any unit containing a manufacturing or materials defect if notified within 24 months from the date of purchase by the original owner. It is the buyer's responsibility to establish with U.S. Divers or an Authorized U.S. Divers Pro-Line Dealer that the unit has such a defect, and for returning it to the service center post-paid and well protected against damage in transit, accompanied by proof of the original purchase date and details of the fault noted. Servicing, or tampering by unauthorized parties will invalidate the warranty. The buyer shall not subject the unit to "dry" pressure testing. Any such testing must be carried out with the unit submersed in water. Repair under warranty will not apply to any unit which has been subjected to sever shock or abuse, and not maintained in accordance with the care instructions.

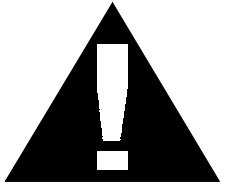
Disclaimer of Liability

U.S. Divers Co., its distributors, and retailers MAKE NO WARRANTIES, either expressed or implied, with respect to the Monitor 3 Air, the programs contained therein, or this instruction manual except for those stated in the preceding paragraph. IT IS EXPRESSLY UNDERSTOOD that by buying or using the Monitor 3 Air, the owner, or any other person who uses it, accepts it "AS IS" with the entire risk as to its quality, performance, merchantability, or fitness for any particular purpose being with the buyer or user. This excludes replacement of defective parts to the original owner, in the first two years after purchase under the conditions set forth in the preceding limited warranty section.

BY PURCHASING THE MONITOR 3 AIR, IT IS AGREED AND UNDERSTOOD THAT IN NO EVENT WILL U.S. DIVERS CO., ITS DISTRIBUTORS, OR RETAILERS BE HELD LIABLE FOR ANY PERSONAL INJURIES FROM ITS OPERATION, OR FOR ANY OTHER DAMAGES WHETHER DIRECT, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL, EVEN IF U.S. DIVERS HAS BEEN ADVISED OF SUCH DAMAGES.

Some states do not allow the exclusion or limitation of implied warranties or liabilities for incidental damages, so the above limitation or exclusion may not apply to you.

Pay special attention to warnings and cautions, which are denoted by this symbol:



WARNINGS alert you to any procedure or situation that may result in serious injury or death.

CAUTIONS alert you to any situation or technique that will result in damage to the product.

Safety Considerations

You must carefully read this entire manual before using your Monitor 3 Air.

WARNING: Diving has many inherent risks. Decompression sickness is among the most serious of those risks. Even if you follow the instructions in this manual carefully, it is possible that you may be seriously injured or die from decompression sickness, or some other inherent risk of SCUBA diving. Unless you are fully aware of these risks and are willing to personally accept and assume responsibility for those risks, do not use the Monitor 3 Air!

The Monitor 3 Air is a sophisticated decompression tool to assist a trained and certified SCUBA diver in making decisions concerning dive planning and execution. As with any tool, the Monitor 3 Air may be misused if the following safety and operational precautions are not strictly followed. If they are followed, careful use of the Monitor 3 Air can increase your diving enjoyment and reduce the risk of decompression sickness (DCS); if they are not followed, you will be placing yourself at serious risk for DCS.

The Monitor 3 Air is a technically advanced tool based on a biophysical model of decompression theory. However, neither it nor any other diving computer (or table) can actually monitor the physical changes that occur in your body as you dive. Each diver varies in his or her susceptibility to decompression sickness, and that susceptibility may vary from day to day. Decompression modeling is an inexact science; it is based, at least partly, on certain unproven assumptions. Therefore, you must dive responsibly and to carefully follow all standard safe diving practices as well as the warnings and cautions contained in this manual.

Guidelines for Using the Monitor 3 Air

The following guidelines for using the Monitor 3 Air are derived from the latest medical research and the recommendations of the American Academy of Underwater Sciences for diving with dive computers. Following these guidelines will increase your safety while diving, but cannot guarantee that decompression sickness will not occur.

1. In accordance with the recommended maximum diving limit of all instructional agencies, do not dive deeper than 130 feet (40 meters).
2. Do not use the Monitor 3 Air for planned decompression diving. The decompression algorithm contained in the Monitor 3 Air should be used only for emergency or unintended decompression.
3. On all no-decompression dives with the Monitor 3 Air, make a safety stop for three to five minutes between 10 and 30 feet (3 and 12 m) before surfacing.
4. Never use the Monitor 3 Air for repetitive, “rectangular” dives deeper than 60 feet (18 meters). A rectangular dive is a dive that is performed for its duration at a uniform depth.
5. Always make the deepest dive of the day first when repetitive dives are planned, and for each successive dive make sure that the deepest portion of that dive is done at the beginning of the dive.

6. The Monitor 3 Air is designed for dives made with compressed air only. Do not use the Monitor 3 Air for dives made with nitrox or other mixed gases.
7. All divers using dive computers to plan dives and indicate or determine no-decompression/decompression status must use their own computer.
8. If the Monitor 3 Air fails at any time during the dive, the dive must be terminated and appropriate procedures (including a slow ascent and a 3 to 5 minute safety stop) should be initiated immediately.
9. On any given dive, all divers in a buddy group must follow the most conservative dive computer for that particular dive.
10. No dive computer can account for dives made without it. Do not dive for a period of at least 24 hours before starting a dive series with the Monitor 3 Air,
11. You MUST follow the ascent rates as indicated by the Monitor 3 Air. If the computer fails, ascend to surface no faster than 60 ft/min (18 m/min).
12. You MUST be familiar with all signs and symptoms of DCS before using the Monitor 3 Air! Seek IMMEDIATE treatment for decompression sickness should any of these signs or symptoms occur after a dive! There is a direct correlation between effective treatment and the delay between the onset of symptoms and the treatment for decompression sickness.
13. Always observe the optical alarm signals of the Monitor 3 Air. Avoid situations of increased risk for DCS which are marked with a warning sign in this manual.
14. Never dive the Monitor 3 Air to its limits, as well as other dive computers and tables. Give yourself a margin of safety by always leaving a few minutes of no-stop time before making an ascent.
15. Avoid repeated ascent and descents (yo-yo diving) while using the Monitor 3 Air.
16. DO NOT perform repetitive decompression dives. Doing so increases the risk of DCS.
17. Carefully inspect your Monitor 3 Air computer for any signs of damage or malfunction before every dive.

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INTRODUCTION

Introduction

Congratulations on the purchase of your Monitor 3 Air dive computer. Our designers have condensed important dive planning information into a user-friendly dive instrument. By combining graphics with bold alphanumerics, we have created an easy-to-use computer that provides dive data at a glance.

As with all diving equipment, it is important to understand the features and functions of the Monitor 3 Air. Before using the Monitor 3 Air, it is essential to read this manual in its entirety. Contained within this easy to read manual are illustrations to aid you in the complete understanding of the computer.

Section 1 instructs you on preparing the Monitor 3 for its first use. Section 2 explains all the functions and screen displays while on a dive. Section 3 shows you how to recall the dive memory. Instructions on planning a future dive are given in Section 4. Care & Maintenance tips are covered in Section 5. Lastly, the reference section contains the technical specifications and a description of the algorithm.

What is a "Dive Computer"

DEFINITION OF COMPARTMENTS

A dive computer is an instrument that mathematically simulates the absorption and release of nitrogen by hypothetical tissue types in the human body. These hypothetical tissues are commonly referred to as "compartments." Each compartment absorbs and releases nitrogen at different rates. The Monitor 3 Air tracks these compartments constantly, providing you with up-to-the-minute decompression information.

MULTI-LEVEL DIVING

If you use, or have used, dive tables you know the total amount of time you can stay under water is based on the maximum depth reached during the dive. Dive tables, such as the U.S. Navy dive tables, assume that you immediately descend to a single depth, stay at that depth for the duration of the dive, then immediately surface from that depth. This type of dive profile is referred to as a rectangular dive profile (figure 1). In reality, however, most recreational divers go to the deepest depth first and make a gradual ascent to the surface. This type of dive profile is referred to as a multilevel dive profile (figure 2).

Multilevel diving is where the Monitor 3 Air excels. By continuously calculating the nitrogen absorption/release of all the compartments, the computer updates the amount of no-decompression time (NDT) you have left. As you ascend to shallower depths, the computer credits you with more allowable NDT; if you go deeper, it reduces the NDT available.

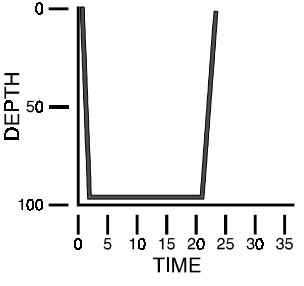
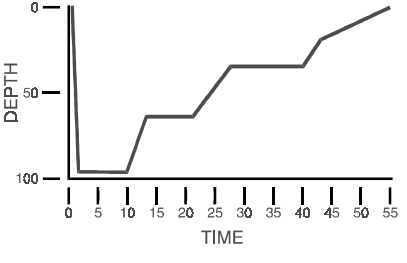


Figure 1
Rectangular Profile

Figure 2
Multi-Level Profile



DIVING RESPONSIBLY

Years of research and thousands of dives have gone into the mathematical formulas used by the Monitor 3 Air. However, the computer does not have special sensors attached to your body; it doesn't know if you are tired, dehydrated, overweight, or out of shape. For this reason, U.S. Divers recommends that you never push the no-decompression limits of the computer. Always leave a comfortable safety margin in respect to no-decompression time, air time and ascent speed. Let the computer assist you in making your dive plan. Do not let it control your dive.

WARNING: Using the Monitor 3 Air will not prevent the possibility of decompression sickness, but using it sensibly reduces this risk. Any sport diver, however, must accept that there is no device or procedure which will totally prevent the possibility of a decompression accident.

Features of the Monitor 3 Air

The Monitor 3 Air is made up of two compact units: the computer/display unit which is usually worn on the wrist, and the high pressure (HP) transmitter which is screwed into the regulator first-stage HP port.

THE COMPUTER SCREEN

The Monitor 3 Air has a large liquid crystal display (LCD) and features large numbers and graphics. The screen is luminous for easy reading during low light dives, including night dives and cave dives.

The screen is organized into four zones (see figure on opposite page): The MODE zone, DEPTH zone, TIME zone and AIR zone. The Mode Zone has five icons which indicate altitude, low battery, Pre-dive Planning Mode, Memory Mode, and Surface Mode.

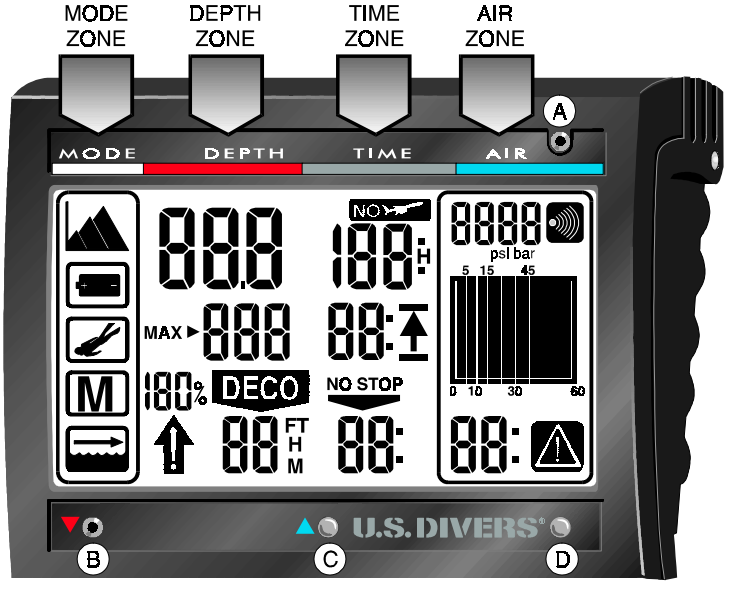
Next to the Mode Zone is the Depth Zone. This grouping of numbers includes the current depth, maximum depth decompression stop depth, and ascent rate information.

Beside the Depth Zone is the Time Zone. The Time Zone shows total dive time, total ascent time, no stop time, and, while in decompression, decompression stop time.

To the far right of the screen is the Air Zone. The Air Zone shows current cylinder pressure, a graphical representation of air time remaining and a digital readout of remaining air time. In addition, their are two warning icons: one for interrupted transmission and the other for high breathing rate.

THE ELECTRICAL CONTACTS

All surface operations and mode changes are made by the use of four electrical contacts placed around the Monitor 3 Air's screen. These contacts are identified as A, B, C and D (see figure on opposite page). As a rule, contact A is always touched in conjunction with one of the other three contacts. After entering different modes, such as Memory Mode or Pre-Dive Planning Mode, contact B always decreases a value, and contact C always increases a value (always in combination with A). To make contact, simply moisten your fingertips and touch the appropriate pair of contacts at the same time. Release the contact as soon as the operation has been activated, usually no more than one second.

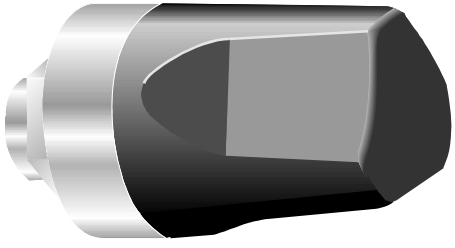


Monitor 3 Air display zones and contact letter designations

THE TRANSMITTER

The compact transmitter module screws into a standard $^{7}/_{16}$" HP port. The transmitter automatically activates when it senses pressure from the cylinder. Once activated, it sends pressure information via a low frequency radio wave to the wrist unit.

One of the unique features of the transmitter is that it sends along a special code each time it transmits pressure information. The computer "listens" to the code, and, if it is the correct code, accepts the pressure information. This feature allows more than one Monitor 3 Air system to be used without information becoming mixed up, i.e. you reading your dive buddy's air information.



The Transmitter

Section 1

PREPARATION

In this section:

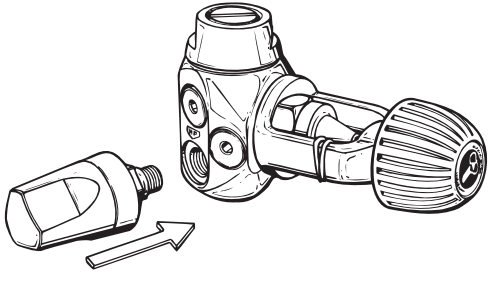
- *Attaching the Transmitter to the Regulator*
- *Pairing the Wrist Unit with the Transmitter*
- *Using the Monitor 3 Air Without the Transmitter*
- *Checking battery power*

Attaching the Transmitter to Your Regulator

Upon purchasing the Monitor 3 Air have your Authorized U.S. Divers Dealer attach the transmitter to your first-stage regulator. If this is not possible, follow the simple steps listed below to do it yourself:

STEP 1 If your regulator is attached to a charged SCUBA cylinder, turn the valve handle to the closed position and vent any air in the regulator by pressing the second-stage purge button. Remove the regulator from the cylinder. If you currently have a gauge attached to your first-stage regulator, remove it using the appropriate sized wrench, otherwise remove the high pressure (HP) port plug from your first-stage regulator using the appropriate size wrench. The HP port on all U.S. Divers regulators is clearly marked with the letters "HP".

NOTE: The transmitter has 7/16" threads. On some early model first-stages the HP port is only 3/8". If this is the case with your regulator, you need to get a 7/16" female to 3/8" male HP adapter (U.S. Divers part number 1017-85) from your U.S. Divers dealer.



STEP 2 Thread the transmitter into the HP port of the first-stage until finger-tight. Using a 3/4" open-end wrench, tighten the hose fitting until snug. DO NOT overtighten.

STEP 3 Attach the first-stage to a charged SCUBA cylinder. Slowly turn the cylinder valve on-off handwheel counterclockwise until the valve is completely open. Submerge the first stage in water and check for any leaks. If you detect leaks, take your regulator and transmitter to your U.S. Divers dealer and have the O-ring inspected and/or replaced. Then have the U.S. Divers dealer attach the transmitter to your regulator.

CAUTION: DO NOT use the transmitter as a carrying handle. Doing so may damage the transmitter requiring its replacement. If the first-stage is attached to a cylinder, make sure to secure the cylinder so it doesn't fall over and damage the transmitter (or regulator). A transmitter damaged due to user neglect is not covered under the warranty.

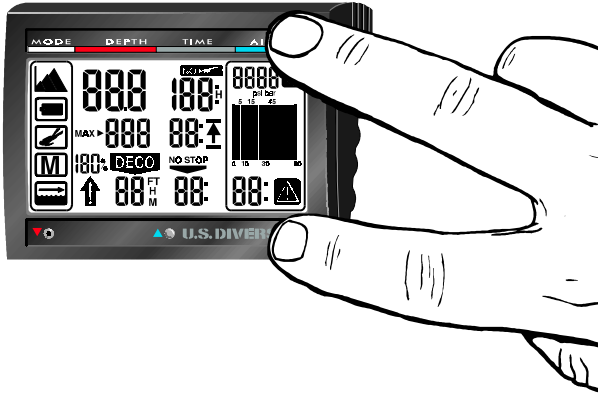
Pairing the Wrist Unit to the Transmitter

For a transmitter and a wrist unit to work together they must be first "paired". Once paired, they will continue to work together until such time the transmitter is introduced to another wrist unit. When the transmitter sends a packet of data to the wrist unit, it sends along a special code that only the paired wrist unit recognizes. If the code is correct, then the wrist unit accepts the data packet. This way you will never get erroneous information from a nearby Monitor 3 transmitter (i.e. your dive buddy's transmitter).

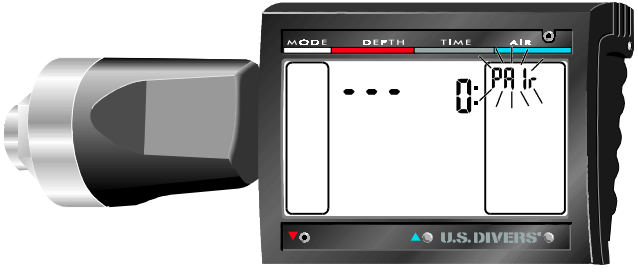
To pair a transmitter to a wrist unit, follow this step-by-step procedure:

STEP 1 Fit your regulator to a charged SCUBA cylinder. DO NOT open the valve yet.

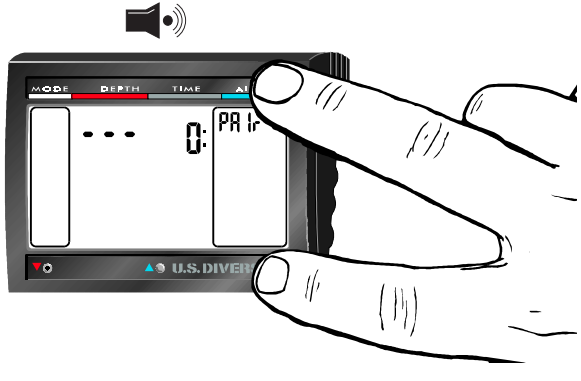
STEP 2 Activate the Monitor 3 Air by touching contacts A&D.



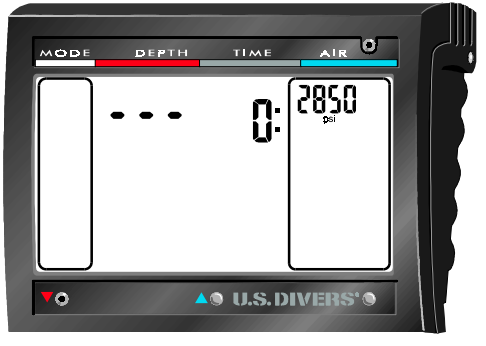
STEP 3 Place the Monitor 3 Air wrist unit directly against the transmitter. Turn on the cylinder valve. Within six seconds the message "PAIr" will appear flashing in the upper tank pressure display.



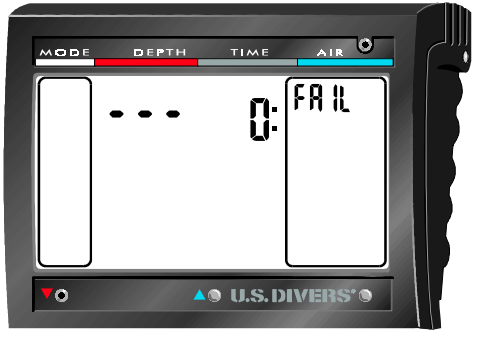
STEP 4 Touch contacts A and D as soon as "PAIr" appears (within 5 seconds). The computer will confirm with a beep and 'PAIr" will stop flashing.



STEP 5 The first cylinder pressure reading will be displayed within 15 seconds.



If the procedure is not successful, a FAIL message will appear. If this happens, close the cylinder valve, purge all air from the regulator and repeat the procedure.



Once paired, the Monitor 3 Air will always display the tank pressure of the cylinder to which the transmitter is connected, whenever it is in range.

Note: The pairing procedure only needs to performed once, before the first use. After that, the only time you need to perform the pairing procedure is when you use a new transmitter, new computer, or have the battery changed. Always check the cylinder pressure before every dive.

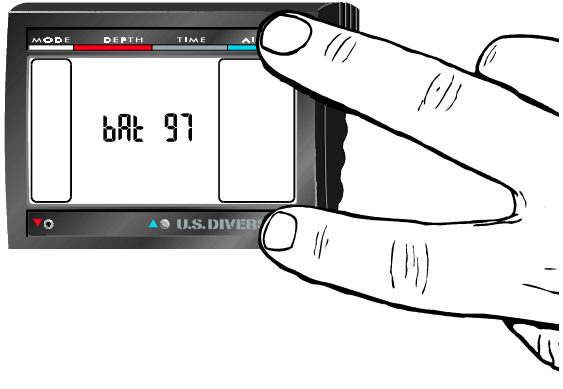
For best possible reception, it is best to fit the transmitter on the same side of the regulator first-stage where you will wear the wrist unit. For example, if you wear the computer on your left wrist, mount the transmitter on the left side of the regulator.

Using the Monitor 3 Air Without the Transmitter

If, for any reason, you are unable to use the transmitter, you can still use the wrist unit as a dive computer. It will provide all the normal information found in the MODE, DEPTH and TIME zones. However, the influence of breathing rate and work load will not be taken into account in the decompression calculations. The AIR ZONE will remain blank and you will need to monitor your cylinder pressure using a conventional gauge.

Checking the Battery Power

You can manually check the battery power of the Monitor 3 Air. While in Ready Mode or Surface Mode, touch contacts A&D. The word "bat" will be displayed along with the battery power. Battery power is given as a percentage, with 99% being the highest percentage displayed. Its a good idea to check the battery power before you start a series of dives.



Section 2

DIVING WITH THE MONITOR 3 AIR

In this section:

- *Preparation for the dive*
- *Functions during the dive*
- *Functions at the surface*
- *Summary of Messages and Alarms*

Preparation for the Dive

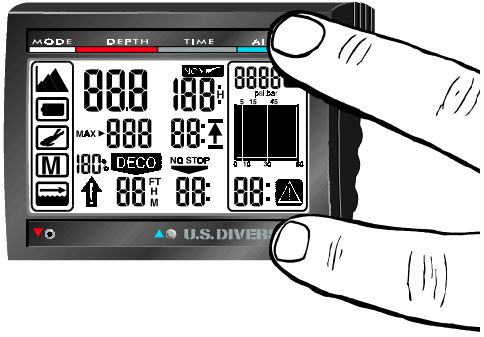
Note: The following preparation instructions assume that the transmitter is installed correctly into your first-stage regulator (see page 8) and that it is paired with the Monitor 3 Air computer (see page 9).

WARNING: If the Monitor 3 Air transmitter is not correctly installed or not paired with the computer, it will not perform properly. If you rely on the computer in this condition to plan your dive, you risk serious injury or death.

STEP 1 Mount the regulator (with transmitter attached) onto the SCUBA cylinder.

STEP 2 If your cylinder has a reserve valve, commonly referred to as a "J"-valve, make sure the reserve lever is in the full open position (lever is pulled down).

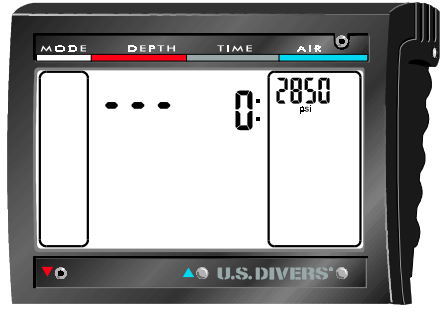
STEP 3 Switch on the Monitor 3 Air by touching contacts A and D. Check the display to make sure all the display elements are lit.



STEP 4 Open the cylinder valve. The transmitter switches on automatically when it senses pressure.

STEP 5 Check the cylinder pressure reading. The cylinder pressure reading appears about 10 seconds after turning on the valve.

STEP 6 The Monitor 3 Air is now in Ready Mode. The computer switches to Dive Mode after entering the water and submerging below four feet. The depth indication may be delayed for a few seconds.



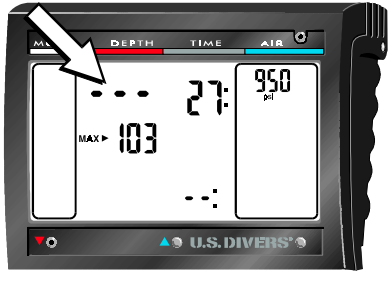
Functions During the Dive

Current Depth

Current depth is displayed in one-foot increments down to a maximum of 330 feet. When the depth is two feet or less, the depth display is replaced with three dashes.

Note: Depth measurement is based on freshwater. When diving is salt water, the depth displayed will be slightly greater than the actual depth, depending on the salinity of the water.

Current depth display at 100 feet

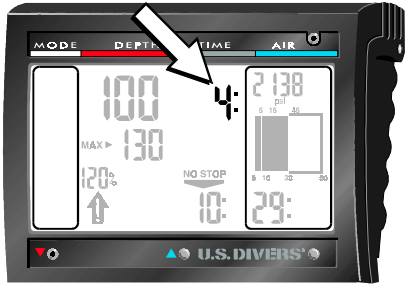


Current depth display at 2 feet or shallower

Dive Time

Dive time, which is displayed in minutes, is the amount of time spent below a depth of 4 feet. While the dive time is running, the colon to the right of the number flashes in one-second intervals. Maximum dive time displayed is 199 minutes.

Note: If a dive lasts longer than 199 minutes, dive time will roll over to 0 minutes.



Dive time display

Maximum Depth

Maximum depth is the deepest depth reached during the dive. It is only displayed when the actual depth is more than three feet shallower than the maximum depth.

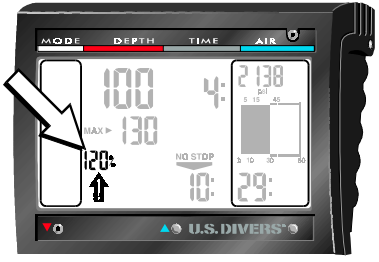
Maximum depth display

Ascent Rate

The optimal ascent rate varies between 23 and 67 ft/min. depending on the depth. Ascent rate is displayed as a percentage of the allowable ascent rate (rounded to the nearest 10 %). For example, if the allowable ascent rate at the current depth is 67 ft/min, and you ascend at 33 ft/min, the ascent rate will display 50%. If you ascend at 67 ft/min the ascent rate will show 100%.

WARNING: The prescribed ascent rate must be observed at all times! Exceeding the prescribed ascent rate can lead to microbubble formation which can lead to serious injury or death due to decompression sickness.

Ascent Rate Display



If the ascent rate is 100% or more, the arrow appears. If the ascent rate exceeds 140%, the arrow starts flashing. Also, an acoustic alarm sounds when ascent rate is 110% or greater. The intensity of the alarm increases as the percentage over the allowable rate increases. Below is a summary of the ascent warnings.

Ascent Rate	Optical Alarm	Acoustic Alarm
110%		
140%		
160%		
180%		

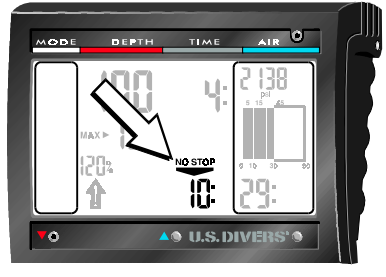
WARNING: Reduce your ascent speed whenever the above alarms appear. Failure to do so may lead to serious injury or death due to decompression sickness.

Some Notes on ascent rate:

- *The Monitor 3 Air may require a decompression stop due to an improper ascent rate, even if you stay within the no-stop limits.*
- *Decompression time necessary for the prevention of microbubbles can increase greatly if the ascent rate is exceeded.*
- *At great depth, ascending too slowly may cause heightened saturation of tissues and increase both decompression time and total ascent time. At shallow depth, a slow ascent may shorten decompression time because the tissues are desaturating during a shallow, slow ascent.*
- *Excessive rates of longer periods are entered in the dive computer's memory*

No-Stop Time

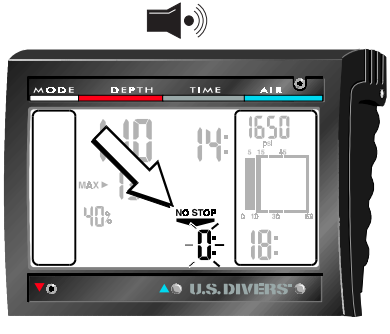
No-Stop Time is the amount of time you can stay at the current depth without making required decompression stops. This number is displayed in minutes, with 99 being the highest number displayed. If 99: is displayed, you have 99 minutes or more of no-stop remaining. No-stop time is easily identified by the no-stop arrow located directly above it.



No-Stop Time Display

WARNING: There is an acoustic alarm if no-stop time is less than one minute. In this last minute, the no-stop display shows a flashing 0. In order to prevent a decompression dive, you must ascend immediately.

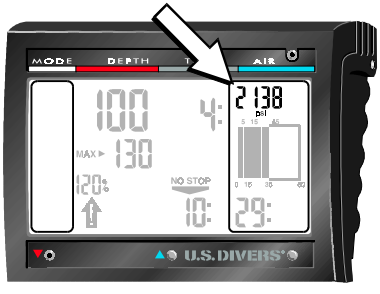
WARNING: It is unsafe diving practice to "push" the Monitor 3 Air, or any other decompression tool, to its limits. Avoid no-stop times of less than 3 minutes at any given depth.



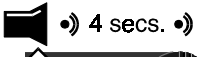
No-stop time at 0 minutes remaining

Cylinder Pressure

Cylinder pressure is displayed in pounds per square inch (psi) in 1 psi increments.



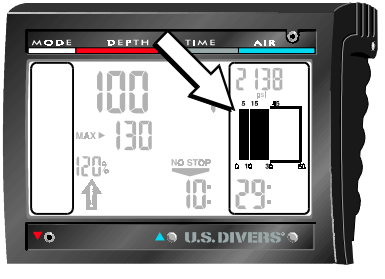
Antenna Symbol



If, during the dive, there is an interruption in the transmission of air data to the Monitor 3 Air for more than 30 seconds, the antenna symbol will appear, accompanied by an acoustic warning. If sensible data is not received within 40 seconds after the antenna symbol appears, the air pressure reading will be replaced by four dashes, and all air time information will disappear. The most likely cause of transmission interruption is the position of the computer in relation to the transmitter. As soon as data is transmitted again, the computer will display the cylinder pressure and air time information.

Graphic Air Time Remaining (ATR)

The graphic air time remaining box gives you, at a quick glance, the amount of air you have left. As your air time lowers, the box empties. For example, if the box is filled up to the 45 minute level, you have between 45 and 60 minutes of air time remaining; if the box is filled to the 30 minute level, you have between 30 and 45 minutes of air time.



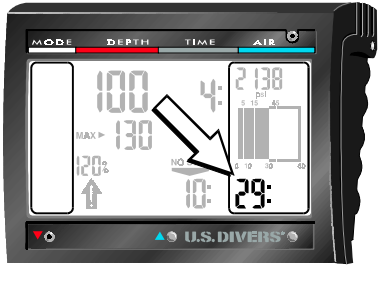
Graphic Air Time Remaining Display

Digital Air Time Remaining (ATR)

Digital air time remaining gives you the amount of time, displayed in minutes, that you can stay at the current depth and still be able to:

- carry out all required decompression stops
- Make a safe ascent to the surface at the permitted ascent rate
- Arrive at the surface with at least 580 psi remaining in your cylinder.

Note: The ending psi level can be altered with the PC interface kit.



Digital Air Time Remaining Display

WARNING: Never allow the ATR to go below three minutes. If the ATR goes below three minutes there is a danger of insufficient air supply for the ascent as well as an increased risk of decompression sickness and serious injury or death may result.

WARNING: Correct calculation of ATR when using a reserve or "J"-type valve is possible only if the reserve lever of the valve is in the open (down) position during the dive.

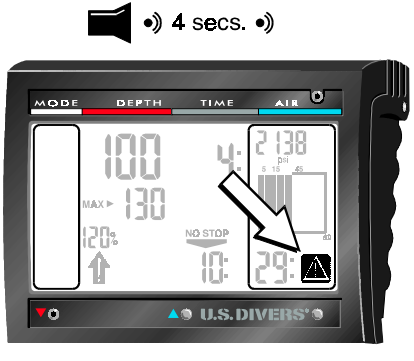
WARNING: If the ATR drops below three minutes, an acoustic attention signal sounds at the ATR digits start to flash.

WARNING: When the last minute has passed (ATR=0) an acoustic alarm is activated every 4 seconds. The digital ATR and graphical ATR start to flash. Start your ascent immediately!

Note: The acoustic alarm on exceeding the ATR is suppressed at depths less than 23 feet if the Monitor 3 is in a no-decompression stop phase.

High Air Consumption Warning

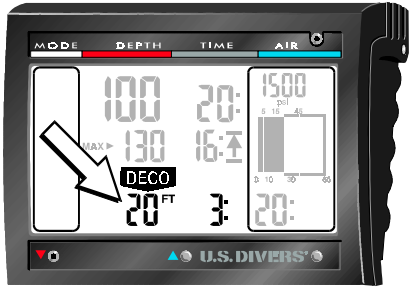
The high air consumption warning appears when you significantly increase your breathing rate. This could be the result of sudden physical effort, emergency situation, or significant leak in the air supply. When this symbol appears, reduce exertion and breathe more slowly.



High Air Consumption Warning

Decompression Stop Information

If you exceed the no-stop limits, the Monitor 3 will replace the no-stop time with the deepest (first) decompression stop depth (in feet) along with the amount of decompression time (in minutes) at that depth. When a decompression stop has been completed, the next shallower decompression stop is displayed, along with its required stop time. When all decompression stops are completed, the DECO arrow disappears and the NO STOP arrow reappears.



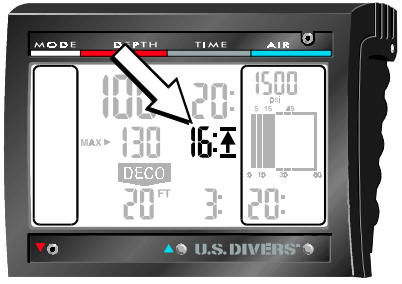
Decompression stop information display

WARNING: If you ascend shallower than the required decompression stop depth, the DECO arrow will start flashing and an acoustic alarm will sound. Due to the formation of microbubbles, decompression obligation can increase greatly if a decompression stop is ignored. When the surface is reached during the decompression alarm, the DECO arrow continues to flash to point out the risk of a decompression accident. If you do not descend immediately to the required stop depth, the Monitor 3 will enter SOS Mode. Any decompression violation longer than one minute is entered in the computers logbook. Ignoring decompression stops may lead to serious injury or death due to decompression sickness.

Total Ascent Time

Total Ascent Time is the addition of all the decompression stop times plus the amount of time it takes to ascend from the current depth to the first decompression stop.

Note: Total ascent time is calculated with an optimal ascent rate of 100% and normal workload. High workloads and different ascent rates may change the total ascent time.



Total Ascent Time Display

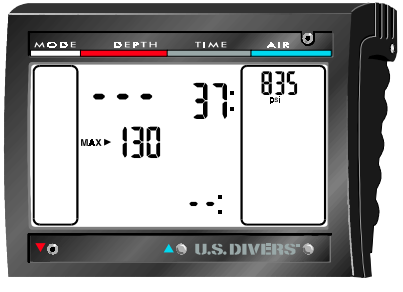
SOS Mode

If you ignore your decompression stop and return to the surface (shallower than 4 feet) for more than three minutes, the Monitor 3 Air switches to SOS Mode. In SOS Mode, the computer displays SOS instead of current depth. While in SOS Mode, the computer cannot be used for 24 hours. SOS Mode can influence the computer's calculations for three days after the incident due to the presence of microbubbles.

Functions at the Surface

Upon surfacing

After reaching the surface, the Monitor 3 automatically switches into wait-mode for five minutes. This is the amount of time necessary to recognize the end of the dive. The five minute delay allows you to come to the surface to orient yourself, then resume the dive. If you stay at the surface longer than 5 minutes, the dive is entered into the logbook and the Monitor 3 Air switches into surface mode.



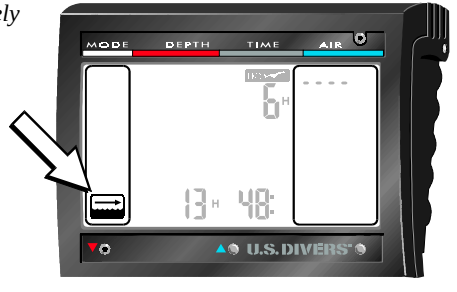
Display immediately upon surfacing

Surface Mode

Note: Surface mode will stay visible for 3 minutes. After that, the screen will go blank to save battery power. To reactivate the surface mode display, touch contacts A and D.

Surface mode icon

Five minutes after surfacing, the Monitor 3 enters Surface Mode. While in Surface Mode, the Surface Mode Icon appears at the bottom of the icon window.

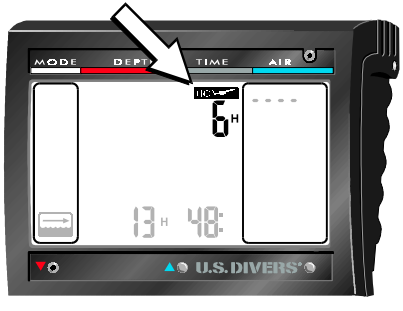


Surface mode icon display

Wait-to-fly Time

Wait-to-fly time is the minimum amount of time you should wait before flying in a commercial airliner. Wait-to-fly time is displayed in hours and is denoted by the no-fly symbol immediately above it.

WARNING: Flying while the Monitor 3 Air is still displaying wait-to-fly time may lead to serious injury or death from decompression sickness.



Wait-to-fly time display

Wait-to-fly Recommendations

The Divers Alert Network (DAN) has made the following recommendations regarding wait-to-fly time:

1. A minimum surface interval of 12 hours would be required in order to be reasonably assured a diver will remain symptom free upon ascent to altitude in a commercial jetliner (altitude up to 8000 ft/2400 m).
2. Divers who plan to make daily, multiple dives for several days, or make dives that require decompression stops should take special precautions and wait for an extended surface interval beyond 12 hours before flight.

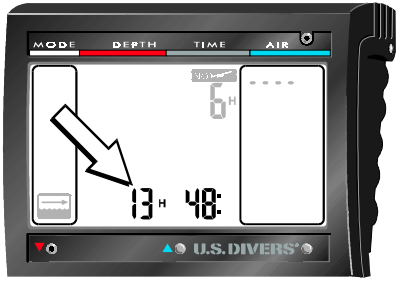
Both the Undersea and Hyperbaric Medical Society (UHMS) and DAN agree that:

"There can never be a flying after diving rule that is guaranteed to prevent decompression sickness completely. Rather, there can be a guideline that represents the best estimate for a conservative surface interval for the vast majority of divers. There will always be an occasional diver whose physiological makeup or special diving circumstances will result in the bends."

U.S. Divers recommends that you follow either the DAN recommendation, or the wait-to-fly time shown by the Monitor 3 Air, which ever is longer.

Desaturation Time

Desaturation time is the amount of time it takes to completely off-gas any residual nitrogen in your system. Desaturation time is displayed in hours and minutes.



Desaturation time display

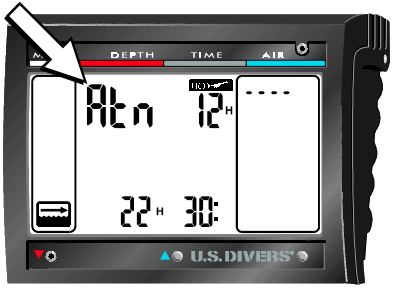
Surface Interval Time

Surface interval time is shown immediately after accessing Memory Mode. For more information on accessing Memory Mode, see page 38, steps 1 and 2.

Microbubble Warning

Repetitive diving may cause microbubbles to accumulate in the lungs if the surface interval between dives is not long enough. Ignoring decompression stops or an excessive ascent rate can also lead to bubble formation. In order to reduce the risk of decompression sickness for future repetitive dives, the surface interval should be planned long enough to reduce the risk of decompression sickness. If the Monitor 3 Air calculates that the formation of microbubbles may occur during the surface interval, it will advise the diver to extend the surface interval. The display "Atn" (= attention) is visible in the depth display area during the surface mode. While "Atn" is displayed, the diver should not undertake another dive.

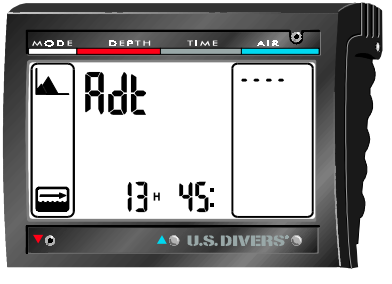
Note: If a dive has to be made while "Atn" is displayed, the amount of "Atn"-time for the following dive can increase considerably. During the dive, no-stop times will be much shorter and decompression times will increase.



Microbubble formation warning
Atn = Attention

Diving at Altitude

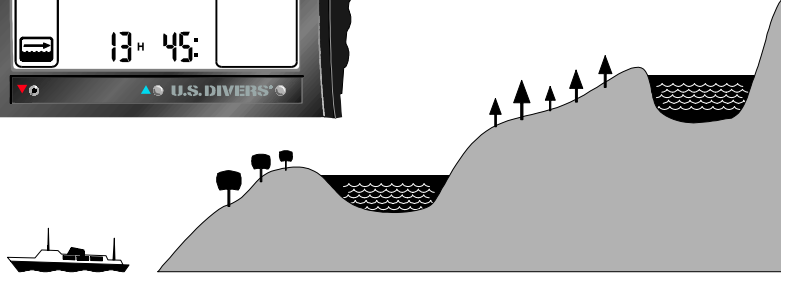
The Monitor 3 Air measures the atmospheric pressure even while in Sleep Mode. If the computer detects a higher altitude, it automatically switches on and displays the adaptation time. This is the time after which your body is considered desaturated and stable at the given altitude.



Altitude adaptation time display Adt=Adapt

Altitude sectors

Atmospheric pressure is influenced by altitude and weather. The Monitor 3 Air is interested only in the actual atmospheric pressure value for use in decompression calculations. However, it indicates the altitude sector which corresponds most closely with this pressure for normal weather conditions. The altitude sectors and their corresponding altitude is illustrated below.



switches at approx 8.85 psi

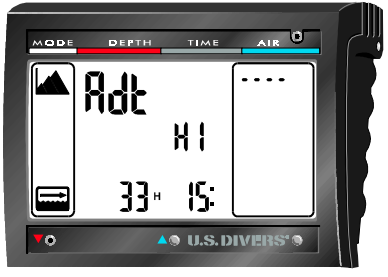
switches at approx 10.51 psi

switches at approx 11.81 psi

switches at approx 13.12 psi

Even the smallest differences in the pressure sensors can cause two computers at the same altitude to display different altitude sectors. (Notice how the altitude sectors overlap in the illustration.) These differences are not meaningful and do not interfere with the operation of the computer. However, if there is an altitude indication while at sea level, or two computers differ by 2 altitude sectors, contact your U.S. Divers dealer for service.

Note: In order to assure optimal decompression even at higher altitudes, the 10-foot decompression stop is divided into a 13-foot stop and 7-foot stop. Therefore, the prescribed decompression stops, in order, are 7 ft, 13 ft, 20 ft, 30 ft ... 80 ft.

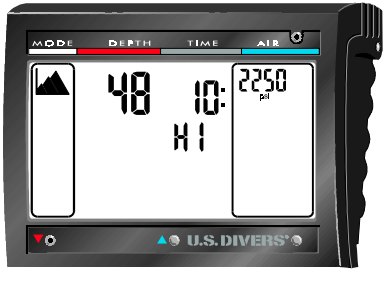


Altitude adaptation display upon exceeding the altitude limit

Exceeding the Altitude Limit

The Monitor 3 Air operates normally up to an altitude of 13,123 ft.. Above that (atmospheric pressure below 8.99 psi), the computer will not show any decompression information or remaining air time. Also, Pre-Dive Planning Mode cannot be started, since decompression information is not available.

If the altitude limit is exceeded, the Monitor 3 Air will display "HI" along with all the altitude sectors.



Diving display when altitude limit has been exceeded

Summary of Attention Messages and Alarms

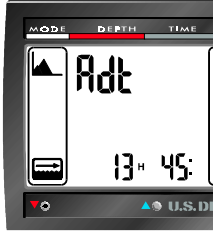
The Monitor 3 Air draws your attention to certain situations and warns you of unsafe diving practices. Attention messages and alarms are always visual and acoustical while underwater; they are only optical at the surface except for the decompression alarm.

Attention Messages

Attention messages are given by symbols, letters, or flashing figures. In addition, two short beeps can be heard, in intervals of 4 seconds, in two different frequencies. Attention messages appear in the following situations:

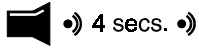
Altitude dive

During a change to a higher altitude, the Monitor 3 Air displays an altitude sector icon and the corresponding adaptation time.



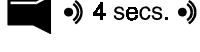
End of no-stop time

To avoid making a decompression dive, a "0" flashes during the last minute of no-stop time to alert you to ascend to a shallower depth. Also, two beeps are sounded.



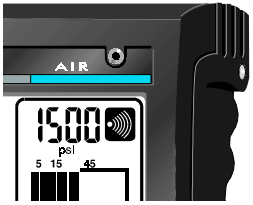
Air Time Remaining is less than 3 minutes

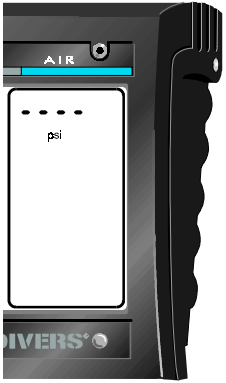
To avoid a potential out-of air situation, immediately begin your ascent.



Lost transmission

If the computer does not receive data from the transmitter, the antenna symbol is displayed, accompanied by two beeps. If this occurs frequently, check the position of the transmitter or computer. If situation persists for more than 40 seconds, air information will no longer be displayed.





Lost transmission after 40 seconds

High air consumption

When there is a significant increase in the air consumption, the warning icon appears, accompanied by two beeps. Relax and breathe more slowly.

Microbubble warning (Atn)

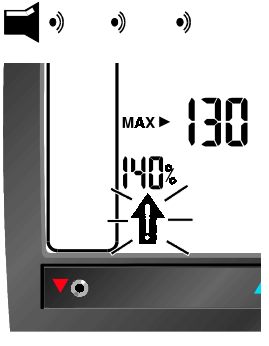
This message is displayed when the Monitor 3 Air calculates that there is an excess of microbubbles in your body tissues. Do not dive while this message is displayed. If you dive while the message is displayed, no-stop times will be reduced and decompression times will be longer.

Alarms

Alarms are communicated to you by symbols, letters, or flashing icons. In addition, an acoustic warning sounds during the duration of the alarm. An alarm occurs in the following situations.

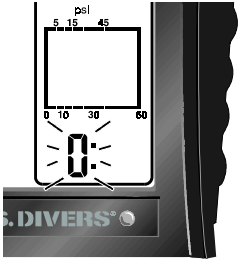
Fast ascent

Reduce your ascent rate (see page 18 for more details on ascent rate)



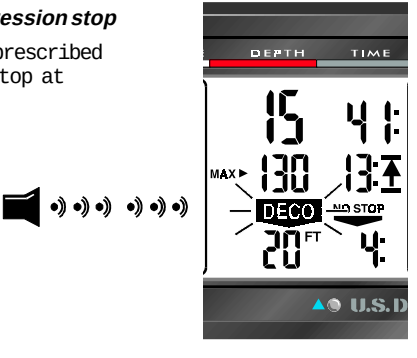
Air Time Remaining = 0

The air supply may be insufficient to safely reach the surface. Start your ascent immediately.



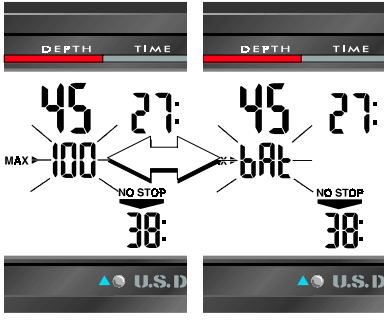
Missed decompression stop

Descend to the prescribed decompression stop at once.



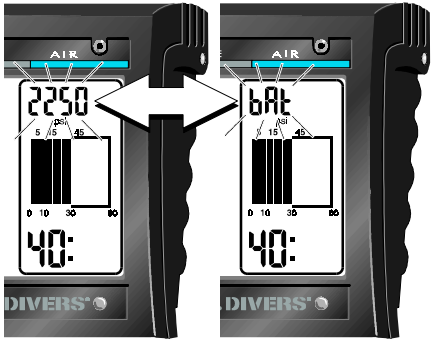
Low computer battery

While diving, "bAt' alternates with the maximum depth display. During Surface Mode or Ready Mode, "bAt" flashes in the maximum depth position. This indicates battery charge is nearing 0%.



Low transmitter battery

While diving, the "bAt" message alternates with the cylinder pressure display. In Ready Mode or Surface Mode, it flashes in place of the tank pressure. This indicates battery charge is nearing 0%.



Section 3

MEMORY MODE

In this section:

- *Activating Memory Mode*
- *Scrolling through logged dives*

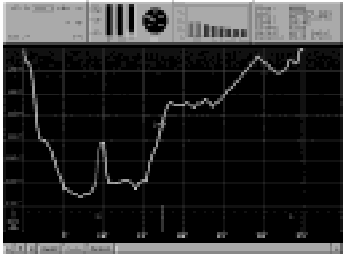
Overview

The Monitor 3 Air wrist unit is able to display the details of the last 19 dives. Any dive that lasts two minutes or longer is entered into memory. After the memory is filled with all 19 dives, the oldest dive is deleted for each new dive entered. All the dive information stays in memory until the battery is removed.

The illustration on the opposite page shows all the information that is logged for each dive.

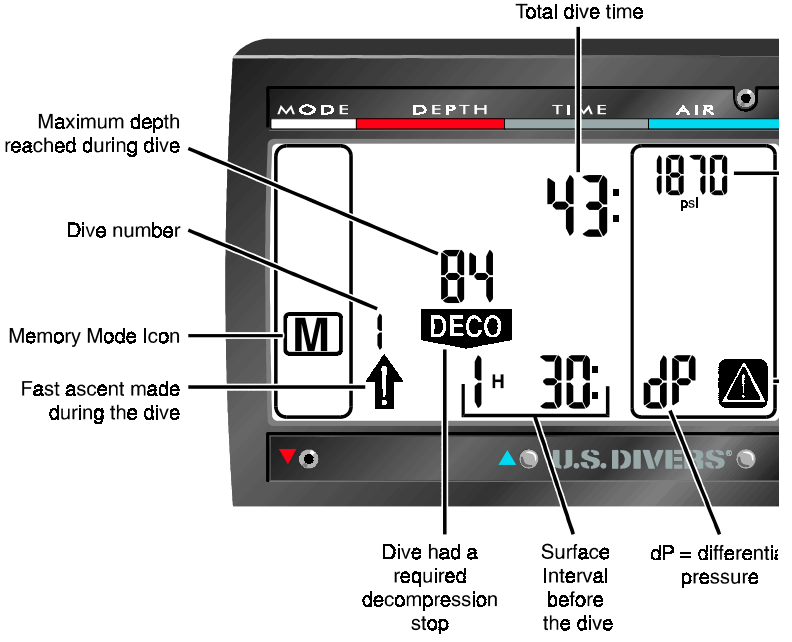
Downloading the Memory to a PC

With the use of a separate interface kit, the Monitor 3 Air has the ability to download the details of the last 37 dives to an IBM compatible computer. In addition, detailed information on the last 200 minutes of diving, sampled every 20 seconds, allows the software to plot a graph depicting your actual dive profile and display the computer information anywhere along the profile.



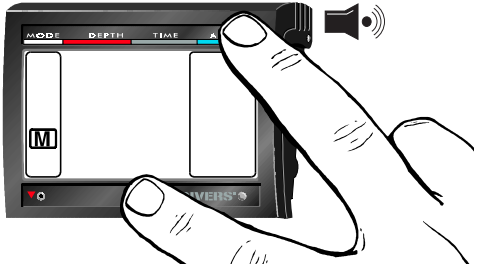
The interface kit and software available from your Authorized U.S. Divers dealer.

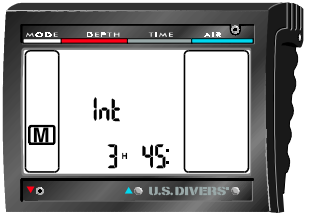
Note: The procedures for downloading data to a personal computer are described in the manual that comes with the interface kit.


Total dive time
Maximum depth reached during dive
Dive number
Memory Mode Icon
Fast ascent made during the dive
MODE
DEPTH
TIME
AIR
84
43:
1870
psi
M
1
DECO
1H
30:
dP
U.S. DIVERS
Dive had a required decompression stop
Surface Interval before the dive
dP = differential pressure

Activation

STEP 1 From *Ready Mode* or *Surface Mode*, touch contacts A & C. The computer will emit one beep and the Memory Mode icon will appear in the mode zone. If activating from Surface Mode, the current surface interval also appears.

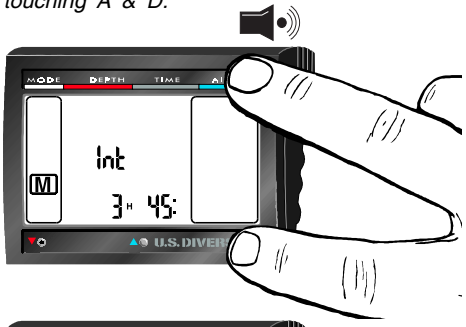


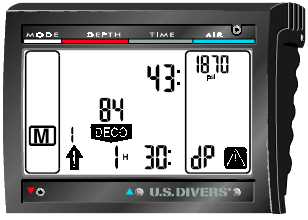


Surface interval time appears when activated from Surface Mode

STEP 2 Touch Contacts A & D to confirm the selection. After a few moments, the information for the most recent logged dive appears.

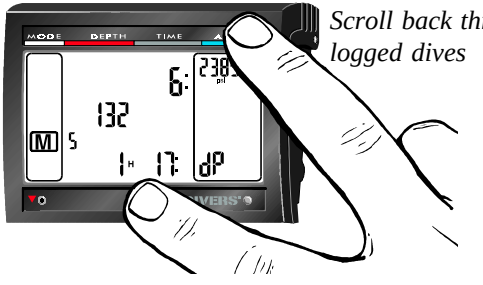
Note: If you are only checking surface time, you can immediately return to Surface or Ready Mode by touching contacts A & B instead of touching A & D.



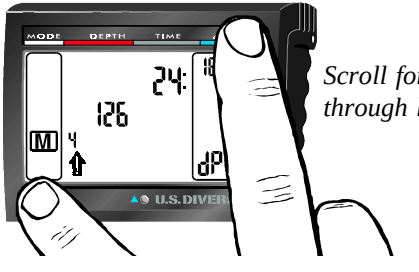


Scrolling through Logged Dives

To scroll back through the memory (towards the oldest dive), touch contacts A & C. To scroll forward through the memory (towards the most recent dive), touch contacts A & B.



Scroll back through logged dives



Scroll forward through logged dives

Note: The absence of a previous surface interval means that the logged dive was the first dive after a complete desaturation.

Exiting Memory Mode

To exit Memory Mode, touch contacts A&D. If there is no activity for three minutes while in Memory Mode, the computer will automatically switch back to Surface or Ready Mode.

PRE-DIVE PLANNING M

In this section:

- *Activation from Ready Mode*
- *Activation from Surface Mode*
- *Planning a Decompression Dive*

Overview

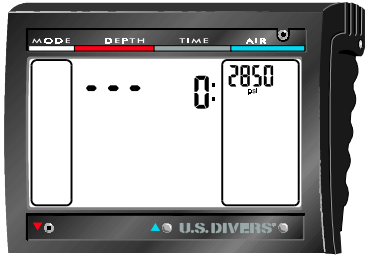
The Monitor 3 Air has a built-in dive planner that allows you to plan both no-stop dives and decompression dives. The planner takes into account the temperature of the most recent dive and altitude.

WARNING: Planned decompression dives violate the responsible diving practice standards of every major diving organization. Recreational or sport scuba divers should not attempt decompression dives. Only professional divers with extensive experience, training, and the appropriate equipment for decompression diving (including the presence of an on-board recompression chamber) should attempt to plan a decompression dive. Those who attempt decompression dives must be willing to accept an increased risk of decompression sickness.

You can access the Pre-Dive Plan Mode form either Ready Mode or Surface Mode. When you access the planner from Surface Mode, you have the option of adding surface-interval time to plan for a dive at some point later in the day.

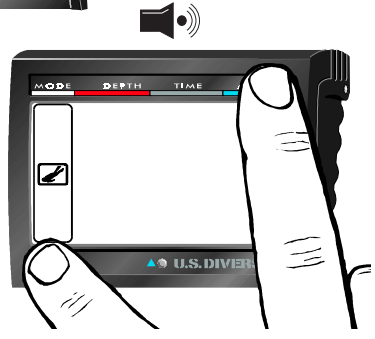
Activation from Ready-Mode

STEP 1 From *Ready Mode,* touch contacts A & B. The computer will emit one beep and the Dive Plan Icon will appear in the mode zone.

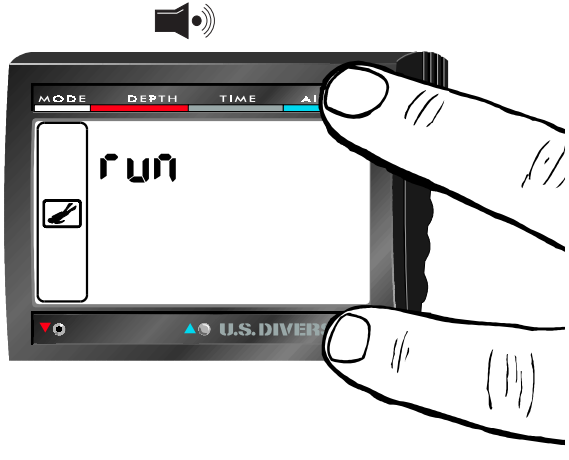


Ready Mode

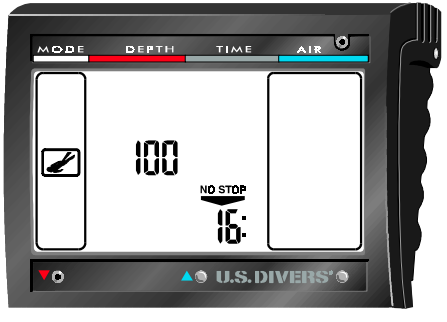
NOTE: Always moisten your fingertips before touching the contacts. Otherwise, you cannot get a good electrical connection. Contacts only need to be touched momentarily unless noted otherwise.



STEP 2 Touch contacts A & D to confirm the selection. The word RUN will flash for about five seconds and then start scrolling through the available time-depth combinations.



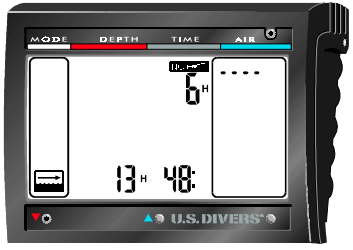
STEP 3 The Monitor scrolls from 50 to 200 feet in 10-foot increments. For each depth the computer gives the maximum allowable no-stop time at that depth.



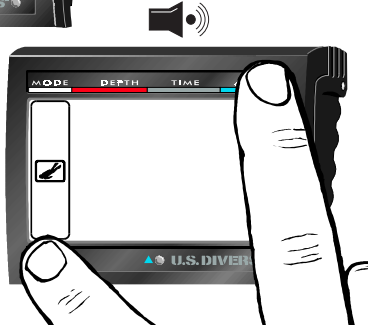
Note: If you want to stay longer than the no-stop time limit, proceed to "Planning a Decompression Dive" on page 46.

Activation from Surface Mode

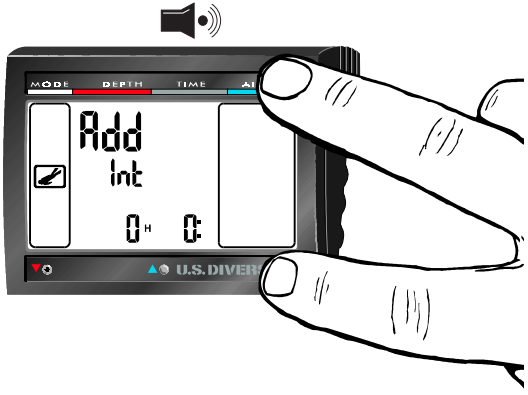
STEP 1 From *Surface Mode*, touch contacts A & B. The computer will emit one beep and the Dive Plan Icon will appear in the mode zone.



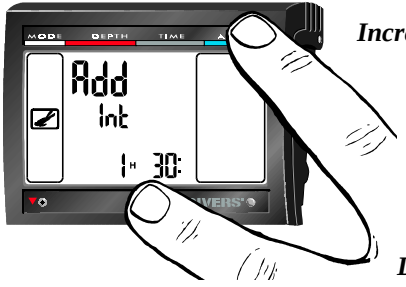
Surface Mode



STEP 2 Touch contacts A & D to confirm the selection. The words "Add" and "Int" appear along with a flashing surface interval time.



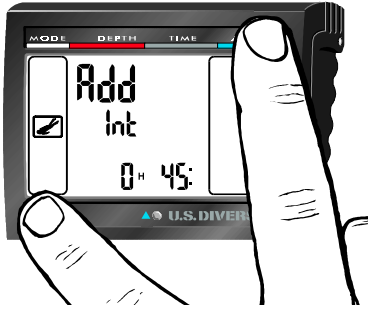
STEP 3 If you do not want to add any additional surface time, go to step 4. If you do want to add surface time, touch contacts A & C. If you add too much surface time and want to decrease it, touch contacts A & B.



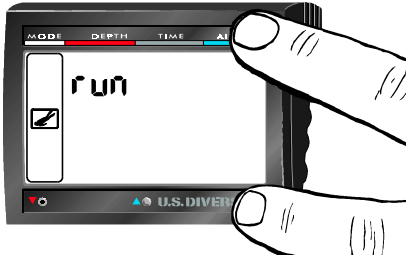
Increase Time

Decrease Time

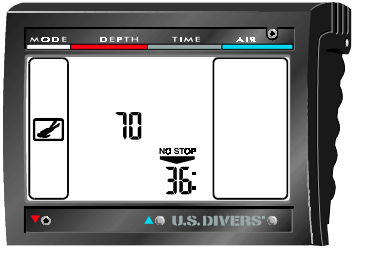
Note: Surface interval time increases in 15 minute increments for the first 6 hours, 30 minute increments from 6 to 12 hours, and 1-hour increments after that.



STEP 4 After adding the desired amount of surface interval time, touch contacts A & D. The word "run" flashes for a few moments, then the Monitor starts scrolling from 50 to 200 feet in 10-foot increments. For each depth the computer gives the maximum allowable no-stop time at that depth.



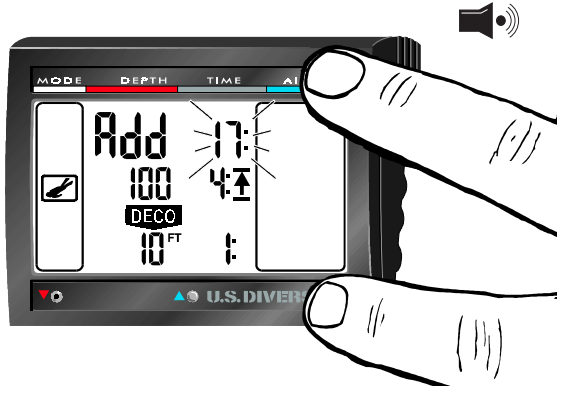
Note: If you want to stay longer than the no-stop time limit, proceed to "Planning a Decompression Dive" on page 46.



Planning a Decompression Dive

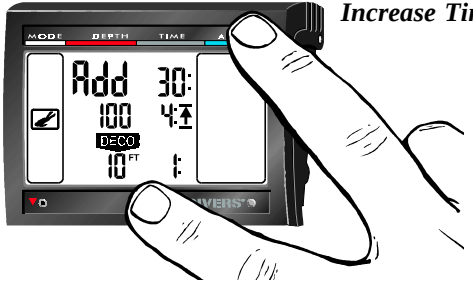
Before planning a decompression dive, reread the import warning at the beginning of this section.

STEP 1 When the Monitor 3 Air scrolls to the desired depth, touch contacts A & D. The word "Add" appears in the depth zone, the flashing dive time is now one minute more than the allowable no-stop time, and all decompression information is displayed, including stop depth, stop time, and total ascent time.

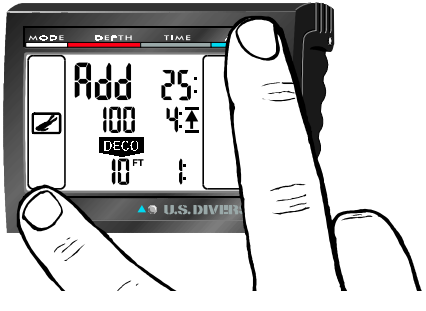


STEP 2 Increase the dive time by touching contacts A & C. If you increase the dive time too much and want to reduce it, touch contacts A & B.

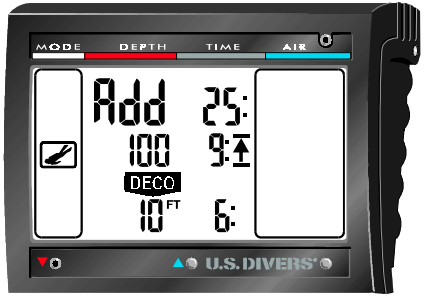
Increase Time



Decrease Time



STEP 3 When you reach the desired dive time, release the contacts and, after a few moments, the Monitor 3 Air will display the new decompression information. You can then, as shown in step 2, increase and decrease the dive time as you wish.



Note: If there is no activity during the Pre-Dive Planning Mode for three minutes, the Monitor 3 Air automatically returns to Surface Mode or Ready Mode.

STEP 4 To return to the pre-dive scrolling, touch contacts A & D. If you want to return to Surface Mode or Ready Mode, touch contacts A & D for about three seconds.

WARNING: If two or more divers using computers are planning a dive, planning for all divers must be based on the dive computer showing the shortest no-stop times. Failure to do this may lead to serious injury or death from decompression sickness.

CARE & MAINTEN

Overview

The Monitor 3 Air is a robust instrument designed to withstand the rigors of SCUBA diving. However, you still need to protect it from shock, extreme heat, chemical attack, and tampering.

Even though the Monitor 3 Air's material is tough and durable, it is susceptible to chemical attack and scratches. Chemical attack can be in the form of spray propellants, gasoline fumes in your garage or boat, and alcohol. U.S. Divers can replace scratched gauge faces. However, small scratches naturally disappear underwater.

CAUTION: Never use aerosol sprays, including silicone sprays, on or near the Monitor 3 Air. The propellants may chemically attack the plastic, causing the plastic case to crack.

Care Before the Dive

The Monitor 3 Air's plastic housing is made of a shock resistant resin. This housing protects the Monitor 3 Air from the normal bumps that occur when diving. However, the computer cannot withstand the impact of heavy objects, such as weight belts or SCUBA cylinders. Impact from heavy objects is the most common cause of computer damage. When you set up your dive gear on a boat or the beach, keep the Monitor 3 Air in its protective case until you are ready to dive. Never leave the computer exposed where someone could accidentally step on it or drop something on it.

Care During the Dive

The most common damage inflicted on a computer while underwater is scratches to the computer face. Avoid inserting your hand into rocky holes while wearing the computer on your wrist (i.e. reaching into a lobster hole to capture the tasty crustacean!)

CAUTION: Scratches to the computer body or gauge face are not covered by the Two-Year Limited Warranty

Care After the Dive

CAUTION: If the Monitor 3 Air transmitter is not attached to a first-stage regulator while soaking (explained below), make sure that water is not allowed to enter the high pressure inlet. Water entering the transmitter may cause damage to the internal components.

After each day of diving, soak the Monitor 3 Air in a warm, fresh water bath to dissolve salt crystals. To dissolve heavy salt buildup, use a slightly acidic vinegar/water bath. After removing the computer from the bath, rinse thoroughly with fresh water. Towel dry the computer before final storage. Place the Monitor 3 Air in a cool, dry and protective case to transport.

The transmitter should be rinsed at the same time the regulator is rinsed. Make sure the transmitter is attached to the first-stage. Connect the first-stage to a charged SCUBA cylinder. Turn on the cylinder valve and submerge the whole regulator/tank system in a bath of water. By applying pressure to the regulator, you absolutely prevent any water from entering the regulator and transmitter.

Annual Dealer Inspections & Factory Service

Factory service was discontinued in 1997. Please contact the original manufacturer, Uwatec, at 800-467-2822.

Operating Temperature

The Monitor 3 Air operates normally between 12°F to 122°F (-10°C to 50°C). You may notice the liquid crystal display (LCD) becoming sluggish at extremely low temperatures. This is normal and will not affect the computer's accuracy.

It is possible to damage the electronics if left exposed to direct sunlight or in a hot, confined space (like a car trunk). After the dive, cover the computer and keep it out of the sun. If inadvertently left in direct view of the sun, the LCD may become totally black. If this occurs, immediately immerse the Monitor 3 Air in water. The display should recover its normal appearance after a few minutes. Damage from extreme heat or cold is not covered under the two-year limited warranty.

Replacing the Battery

The Monitor 3 Air's battery is not user-replaceable. It must be returned to the factory for replacement. Factory service was discontinued in 1997. Please contact the original manufacturer, Uwatec, at 800-467-2822.

Section 6

REFERENCE

Technical Specifications

Operational Performance

Depth Range:	0-330 feet
Time Measurement:	0-199 min.; Quartz timing
Air Pressure Range:	3625 psi
Temperature Range:	14ºF to 122ºF
Display:	High contrast, custom liquid crystal with back luminescence
Data Transmission:	Long wave radio transmission
Transmitter Connection:	7/16" UNF regulator HP port
Dive Log Mode	Stores last 37 dives in memory After 37 dives, adds latest dive to memory, deletes oldest dive (37 most recent dives are retained in memory)
Altitude range:	0-13,200 feet above sea level; Full computer functions up to 13,200 ft.
Battery:	LR07 long life lithium battery (factory replaceable only)

No-Decompression Model

- ZH-L8 ADT
- 8 tissue compartments, 5 to 640 minutes
- Decompression stop depths at 10 to 80 feet in 10-foot increments

ZH-L8 ADT Calculation Model

The Monitor 3 Air uses a new calculation model known as the ZH-L8 ADT. This model uses eight compartments or "tissue" groups with half-times ranging from 5 to 640 minutes. This calculation model is based on the most current research conducted by the late Dr. A.A. Buhlmann. Most computer decompression models only take into account time and depth; the Monitor 3 Air model also factors in other physiological factors, including temperature, breathing rate and workload.

Workload and Temperature

Blood perfusion to the body's organs is not constant. Skin and muscle tissues are especially subject to changes in blood perfusion, depending on temperature and workload. Changes in blood perfusion to these organs change their nitrogen saturation tolerance. The ZH-L8 ADT model takes these effects into account and thus the "skin" and "muscle" compartments in the Monitor 3 Air have variable half-time periods and saturation tolerances.

Decompression information is calculated according to the diver's individual workload and decrease in skin temperature. The decrease in skin temperature is based upon the water temperature and the dive time. By considering these changes in saturation, the time that must be spent at the surface prior to flying can be considerably lengthened, depending on the depth, time, and temperature of a dive, as well as the diver's workload during that dive.

Microbubble Formation

The ZH-L8 ADT model considers nitrogen in both its dissolved and gaseous phase (microbubbles). Formation of microbubbles is considered to be a strong indicator of a high risk of decompression sickness. The model calculates the formation of microbubbles depending on various assumed influences in arterial and venous blood. During normal, slow ascents, microbubbles form mainly in venous blood. During fast ascents, microbubbles may also form in arterial blood and the body's tissues. If a particular dive profile results in the formation of microbubbles, decreased bottom time and/or increased decompression times, and increased wait-to-fly times, will be indicated.

Microbubbles can form if the diver makes a fast ascent, ignores decompression stops, or makes repeated ascents during a dive (yo-yo diving). These microbubbles can form in arterial blood and body tissues. If these microbubbles partially impair circulation, the rate of gas diffusion and saturation tolerance of surrounding tissues are changed. If required, both decompression time and remaining bottom time will be adjusted in such a way that already existing microbubbles will stop growing. Increased decompression

time will also assist those local areas of impaired circulation to desaturate with less risk of decompression sickness.

The calculation of microbubbles results in altered ascent instructions. If microbubbles are assumed to be present based on the data used by the Monitor 3 Air, the ascent rate is reduced to 23 feet/minute. This will help prevent the formation of microbubbles in the arterial circulation and minimizes formation of microbubbles in the venous circulation after the dive.

Summary

With its new decompression model, the Monitor 3 Air is a versatile tool which can increase your diving comfort and safety. As with any diving tool, however, ultimate responsibility for diving safety remains with the individual diver. The same responsible diving practices taught by all diving certifications are still absolutely necessary in order to safely dive with the Monitor 3 Air.